

Serial No.: 10/519,242
Filed: December 22, 2004

Remarks

The Examiner has rejected claims 1-2, 4-11 under 35 USC §103(a) as being unpatentable over Jun (JP 2001-133984), in view of Mineo et al, evidenced by Toshisuke et al. Claim 12 has been rejected under 35 USC §103(a) as being unpatentable over Jun (JP 2001-133984), in view of McGinness et al.

The applicants have amended claim 1. No new matter has been added.

Claim 1 refers to an anti-reflective coating composition which comprises a fluorine-containing polymer, an acid, an amine and an aqueous solvent capable of dissolving these components, further where the coating composition has a pH ranging from about 1.0 to about 6.0, and further where the fluorine-containing polymer is a polymer comprising a polymer unit represented by the following general formula (I),



wherein R_f represents a straight or branched perfluoroalkyl group which may contain an etheric oxygen atom, further wherein the acid is at least one member selected from the group consisting of sulfuric acid, hydrochloric acid, nitric acid, phosphoric acid, hydrofluoric acid, hydrobromic acid, alkylsulfonic acid, alkylbenzenesulfonic acid, alkylcarboxylic acid, alkylbenzenecarboxylic acid, and those obtained by replacing all or part of the hydrogen atoms of the aforesaid alkyl group by fluorine atoms, and further where alkyl of the acid is 1 to 20 carbon atoms and the acid is in the amount of 0.1% by total weight to 2.0% by total weight.

Support for the amended claim 1 is present on page 8, 2nd paragraph.

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The prior art cited by the Examiner refers to an acid in the composition, specifically acetic acid. Mineo discloses the use of acetic acid at concentrations of around 20-30 weight% to improve solubility of the components. The present invention refers to the acid being in the composition in the amount of 0.1% by weight to 2.0% by weight by total weight of the antireflective coating composition. Specifically, Mineo discloses in the English machine translation, section [0022], "the amount used is usually 20 or less% of the weight preferably 30 or less% of the weight of all solvents". Firstly, Mineo teaches only that the solubility is increased by adding low-grade alkyl carboxylic acid and secondly, that the concentration of the acid is in the preferable range of 30-20 weight%. The applicants have presented data in the attached Declaration that show that at concentrations of acetic acid of around 20 weight% and around 30 weight%, there is a very large loss of film thickness in the developed photoresist and also a very large variation in the film thickness across the film of the photoresist, where both of these properties are unacceptable lithographically. Nonuniformity of the developed photoresist film and a large loss of the photoresist film thickness deleteriously effects the etching properties of the substrate. A non uniform substrate surface is obtained after etching if the developed photoresist is nonuniform. If too much of the photoresist thickness is lost then the developed photoresist is not a good etch mask and too much of the substrate surface may be etched away. The applicants have found that if the acid concentration is in the range of 0.1 to 2 weight%, the changes in the photoresist film thicknesses are low and acceptable lithographically, without impacting solubility or refractive index. The applicants believe that the prior art does not teach that the use of the acid at a specific concentration of 0.1 to 2.0 weight% would unexpectedly improve the lithographic performance of the coating composition. Therefore, the applicants believe that the current claims are not obvious over the cited prior art.

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McGinness discloses a composition comprising a polymer, crosslinking compound and a catalyst, and teaches that the catalyst is used to complete the reaction of the crosslinking compound with the polymer, where the 'reaction' obviously refers to the crosslinking of the polymer with the crosslinking agent, {0029} '...the resulting polyester is then dissolved in a solution...and crosslinked with a crosslinking stock solution...To this one can add a catalyst selected from dodecylbenzenesulfonic acid..', [0039] 'To this is added sufficient catalyst ..to complete the reaction.'. The only possible reaction which is disclosed is the crosslinking reaction. The catalyst may be dodecylbenzene sulfonic acid. The composition is crosslinked using a catalyst to crosslink the coating, with the obvious purpose of reducing the solubility of the film. The present invention relates to a composition which is coated on top of the photoresist and is removed in the developer (page 16, lines 21-23 of the present specification) and therefore cannot be crosslinked. The prior art composition is crosslinked, is absorbing due to a chromophore [0019], is coated on a substrate [0030] and not on a photoresist, and is not removed by the developer because it is crosslinked. The present invention does not use the acid to crosslink the polymer, thus one of ordinary skill in the art would not look to the teaching of a crosslinking catalyst in McGinness to add to a distinctly different composition which is not to be crosslinked, is also coated on top of a photoresist, and is removed in an aqueous alkaline developer. Quite in contrast to the use of the acid in McGinness to crosslink the film, the acid in the present invention is used to control the shape of the photoresist features by selectively dissolving the surface of the photoresist, page 9 last paragraph. Thus the acid serves a totally different function in the present invention as compared to McGinness. Therefore, since there is no useful technical teaching in McGinness as related to the present invention, the applicants request that the Examiner remove McGinness as a prior art reference.

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In view of the above remarks, the present application is believed to be in condition for allowance, and reconsideration of it is requested. If the Examiner disagrees, he is requested to contact the agent for Applicants at the telephone number provided below.

Respectfully submitted,



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